REMARKS

Claims 1-5, 23-24, 26-27, 33-35, 39-40, 42, and 44-46 are pending. Claims 6-22, 25, 28-32, 36-38, 41 and 43 have been cancelled. Each of independent claims 1, 23, 33 and 39 has been amended to further define the invention. Based on these amendments, the Applicants submit that the claims are patentable over the cited art. Rejections targeting the canceled claims are rendered moot. Although the amendments were made to further define the invention, the Applicants reserve the right to reintroduce claims of similar or broader scope in a later continuation application, if so desired. No new matter has been introduced through these amendments.

Applicants appreciate the Examiner's time during the interview of November 16, 2006. The amendments contained herein are consistent with the discussion that took place during the interview.

Rejections under Section 112, First Paragraph

Claims 6-11 and 17-22 were rejected as failing to comply with the written description requirement. The Applicants submit that the limitation identified by the Examiner to be missing from the application were actually defined, but stated in slightly different wording. However, to avoid any issue regarding this rejection and move prosecution forward, the Applicants have opted to remove the limitation and have cancelled the respective claims. Accordingly, the comments regarding enablement are rendered moot.

Rejections under 35 USC 101

The Applicants submit that the claims do define patentable subject matter as allowed under Section 101. Claims 1-46 were rejected under 35 U.S.C. 101 as being directed to non-

statutory subject matter. Specifically, the Examiner asserted that the invention as recited in each of claims 1-46 represents an abstract idea, i.e., represents a judicial exception to the statutory classes of 35 U.S.C. 101. The Office has further asserted that each of claims 1-46 fails to recite a practical application that produces a useful, concrete, and tangible result, thus causing the asserted judicial exception to be non-statutory.

Each of the method claims have been amended to recite that the methods are "computer implemented." Additionally, claim 1 was amended to recite a tangible result i.e., the operation of rendering the approximated lighting for the point of the display object on a screen. Claim 23 was amended to recite that the shading characteristics of the object are rendered in real time for display on a screen. Claim 33 was amended in similar form. A practical application that produces a useful, concrete, and tangible result is therefore claimed. Accordingly, the Office is requested to withdraw the rejections of the amended claims under 35 U.S.C. 101.

Claim 33 recites a computer readable medium which represents an article of manufacture. Therefore, the Applicants submit that the computer readable medium of claim 33 does not represent an abstract idea. The Examiner has asserted that because the program instructions included on the computer readable medium as recited in claim 33 represent an abstract idea, the computer readable medium itself is non-statutory.

The judicial exceptions to the statutory classes are abstract ideas, laws of nature, and natural phenomena. A computer readable medium representing an article of manufacture is neither an abstract idea, a law of nature, nor a natural phenomena. Therefore, a computer readable medium is not a judicial exception, and the useful, concrete, and tangible result analysis does not apply to the computer readable medium. Moreover, the "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility," specifically ANNEX IV subpart (a), state the following:

"a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory."

The Applicants submit that the computer readable medium as recited in claim 33 does in fact represent statutory subject matter per 35 U.S.C. 101. The Examiner also points to the specification, which provides an expansion to electromagnetic wave carriers. However, what is claimed is "computer readable media," and not the carrier wave, which is another embodiment that can later be introduced by the Applicant in a continuation, if so desired. Therefore, the Office is requested to withdraw the rejection of claim 33 and dependent claims 34 and 35 under 35 U.S.C. 101.

Rejections under 35 USC § 102

Claims 39, 42 and 46 were rejected as being anticipated by the article authored by Kautz et al. This rejection is traversed, in view of the amendments.

Claim 39 was amended to define the processing operations of determining the lighting characteristics. The determining includes applying a ray tracing algorithm through the stream processor and determining a direct illumination transfer function through a biased approximator for the point in real time. Then, determining a secondary lighting contribution in real time, where the secondary lighting contribution is identified through a series of multiply and add operations, resulting in coefficients that represent surface reflectance. In another operation, the coefficients that represent the surface reflectance with the direct illumination transfer function are combined to render the lighting characteristics of the point of the object. The computing device was further clarified to include a display screen that is in communication with the GPU, and the display screen is configured to present image data that

represents the object. In addition claim 39, as amended includes the feature of a graphics processing unit capable of determining lighting characteristics for a point of an object in real time during a video presentation. The aforementioned amendments present a number of patentable features, not taught nor suggested by the art of record.

As noted in paragraph 69 of the Office Action of September 6, 2006, Kautz et al. does not teach a display. Accordingly, the Examiner is respectfully requested to withdraw the Section 102 rejection, as not all elements are taught by Kautz et al. The Examiner is requested to note that claim 39 includes the feature of implementing a biased approximator. In paragraphs 58 and 59 of the Office Action of September 6, 2006, the Examiner indicated that the other art, namely "Sloan et al. and Purcell et al." in combination is silent as to biased or unbiased compensation. Also, as noted in paragraph 27 by the Examiner, Sloan et al. does not teach using a stream processor to compute the rays, which determines the transfer function. For at least these reasons, claim 39, as amended, is submitted to be patentable over the art of record.

Rejections under 35 USC § 103(a)

Claims 1-5 were rejected as being unpatentable under 35 USC 103(a) over the Sloan article in view of the Purcell article and further in view of Neagle. Applicants respectfully request reconsideration of these rejections in light of the amendments and arguments contained herein.

Claim 1 has been amended to include the feature of displaying a video object in real time during a video presentation. As discussed during the interview of November 16, 2006, the Sloan article is directed to a static image where lighting characteristics are stored and then used at a later time to display the static image, as contrasted to during a video presentation. As acknowledged by the Examiner, Sloan does not teach executing a ray tracing algorithm

through a stream processor. The Examiner asserts that Purcell teaches this feature and one skilled in the art would have been motivated to combine Sloan and Purcell to achieve better performance tracing rays which would have been advantageous for interactive systems. Applicants respectfully disagree that Purcell teaches a stream processor. As discussed in the interview, Purcell specifies that in the future the graphics pipeline is likely to evolve into a stream processor (see abstract). Furthermore, one skilled in the art would not have combined the Sloan and Purcell articles as suggested by the Examiner. As discussed during the interview and as stated in the previous office action, under the combination of Sloan and Purcell the geometry for a frame of data is provided to a GPU from a central processing unit (CPU). Purcell then teaches that the GPU would produce from this geometry a transfer function. The transfer function would then have to be sent back to the CPU to have the geometry assembled as each vertex is associated with a transfer function, as taught by Sloan. This data would then be sent back to the GPU to put polygons on the screen through a normal rasterization process. This back and forth processing would be unable to be performed frame by frame in real time, e.g., for a video game. The combination of Sloan and Purcell provide a single solution and the back and forth processing between the CPU and GPU required for multiple frames of data would prevent the capability of performing these operation in real time for a video presentation, such as in a video game application. Accordingly, Applicants respectfully submit that the combination of Sloan and Purcell do not teach each of the features of amended claim 1 and that one skilled in the art would not have combined the references as suggested by the Examiner.

Continuing with claim 1, the Examiner acknowledges that the combination of Sloan and Purcell does not teach a sampling location within a texel. The Examiner relies on Neagle to teach this feature and provides that the motivation for combining the references is to sample at a location that is more representative of the given texel than any neighboring texel.

As discussed in the interview and as stated in a previous Office action response, Neagle does not teach the feature of sampling at the center of a texel, as Neagle is limited to supersampling for pixel data, as pixels are not texels. Texels exist in 3D space, or world space, while pixels are in 2D space. Furthermore, Neagle specifies sampling a center of a pixel area, i.e., a neighborhood or group of pixels (see paragraph 256). The supersampling provided through Neagle refers to when a greater number of pixel data are available than can be displayed on a display screen. Thus, to minimize aliasing and pixilation, supersampling is applied where some of the extra pixel data is used to modify the displayed pixels. A pixel is still a single data point and cannot be sampled at a center point as this is meaningless for pixel data. A neighborhood of pixels may be used to modify the pixel data, as taught by Neagle, however, this does not disclose determining an approximation at a center point of a texel. Accordingly, claims 1-5 are patentable over the cited references for at least the above stated reasons.

Claims 23, 24, and 26 were rejected as being unpatentable under 35 USC 103 over the article of Sloan in view of the article of Purcell. This rejection is requested to be withdrawn in light of the amendments and arguments contained herein.

Claim 23 includes the features of rendering shading characteristics of an object in real time during a video presentation and the feature of determining a secondary lighting contribution in real time during the video presentation. As mentioned above, neither Sloan nor Purcell teach these features. As further specified in claim 23, each operation is performed through a single graphics chip. As discussed above, the combination of Sloan and Purcell would not convey this to one skilled in art as a graphics processor and a central processing unit are required for the combination of these references. Accordingly, claims 23, 24, and 26 are allowable for at least these reasons.

Claim 27 was rejected as being unpatentable over the combination of Sloan, Purcell and Bonello. Claim 27 depends from claim 23 and is patentable over the cited combination

for at least the above stated reasons as Bonello fails to cure the deficiencies of Sloan and Purcell.

Claims 33-34 were rejected as being unpatentable under the same rationale as for claim 23. Amended claim 33 and dependent claim 34 are now patentable over the cited combination for at least the same reasons as specified above with regard to claim 23.

Claim 35 was rejected as being unpatentable over the combination of Sloan, Purcell and Bonello. Claim 35 depends from claim 33 and is patentable over the cited combination for at least the above stated reasons as Bonello fails to cure the deficiencies of Sloan and Purcell.

Claims 40 and 45 were rejected under 35 USC 103 as being unpatentable over the combination of Kautz and Drebin. Claims 40 and 45 depend from claim 39. As discussed above Kautz fails to teach each and every feature of amended claim 39. Drebin fails to cure the deficiencies of Kautz. Accordingly, claims 40 and 45 are patentable over the cited references for at least these reasons.

Claim 44 was rejected under 35 USC 103 as being unpatentable over the combination of Kautz and Purcell. Claim 44 depends from claim 39. As discussed above Kautz fails to teach each and every feature of amended claim 39. Purcell fails to cure the deficiencies of Kautz. Accordingly, claim 44 is patentable over the cited references for at least these reasons.

In view of the foregoing, Applicants respectfully submit that all of the pending claims are in condition for allowance. A notice of allowance is respectfully requested. In the event a telephone conversation would expedite the prosecution of this application, the Examiner may reach the undersigned at **(408) 774-6921**. If any fees are due in connection with the filing of this paper, then the Commissioner is authorized to charge such fees to Deposit Account No. 50-0805 (Order No. SONYP024). A copy of the transmittal is enclosed for this purpose.

Respectfully submitted,
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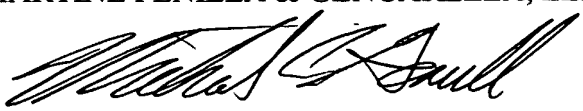

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